



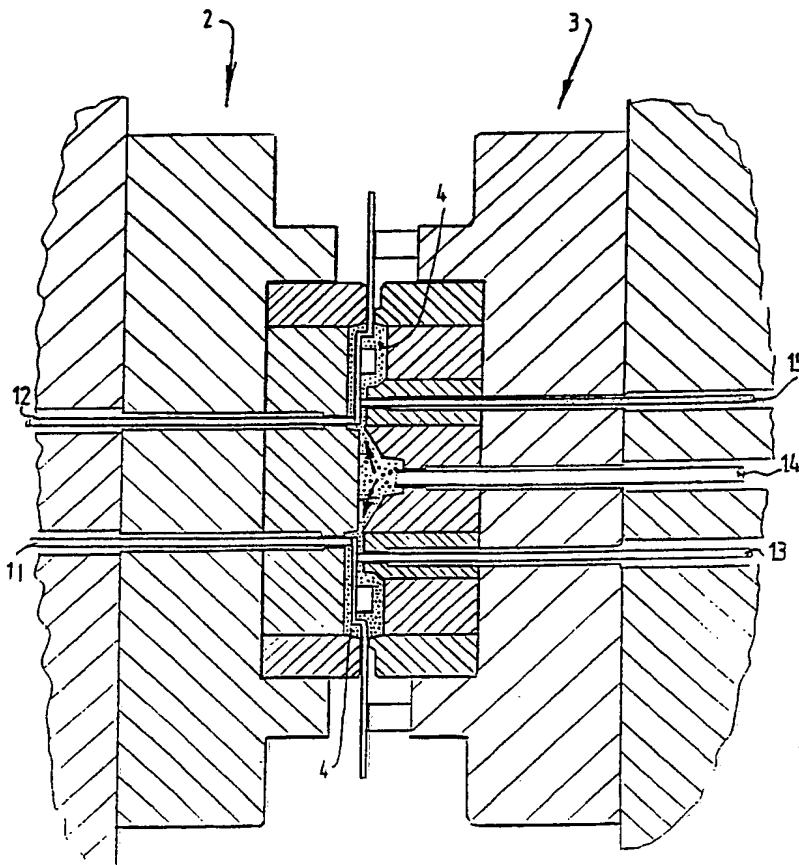
## INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

<b>(51) International Patent Classification <sup>5</sup> :</b>  <b>H05K 13/00, H01L 21/00</b>	<b>A1</b>	<b>(11) International Publication Number:</b> <b>WO 93/14618</b>  <b>(43) International Publication Date:</b> 22 July 1993 (22.07.93)
<b>(21) International Application Number:</b> PCT/EP93/00073 <b>(22) International Filing Date:</b> 11 January 1993 (11.01.93)  <b>(30) Priority data:</b> 9200028                      13 January 1992 (13.01.92)      BE  <b>(71) Applicant (for all designated States except US):</b> ASM-FICO TOOLING B.V. [NL/NL]; Nijverheidsstraat 14-16, NL-6914 AD Herwen (NL).  <b>(72) Inventor; and</b> <b>(75) Inventor/Applicant (for US only) :</b> GIESEN, Henricus, Bernardus, Antonius [NL/NL]; Gladiolenstraat 1, NL-6942 VN Didam (NL).  <b>(74) Agent:</b> HOIJTINK, Reinoud; Arnold & Siedsma, Sweelinckplein 1, NL-2517 GK The Hague (NL).		<b>(81) Designated States:</b> JP, KR, US, European patent (AT, BE, CH, DE, DK, ES, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE).  <b>Published</b> <i>With international search report.</i> <i>With amended claims.</i>

**(54) Title:** APPARATUS FOR MOULDING A LEAD FRAME AND CHIPS ARRANGED THEREON

**(57) Abstract**

In an apparatus for moulding with encapsulating material a lead frame and chips arranged thereon, the lead frame is not only supported in the mould cavity defined by the mould halves by clamping of the edge zones of the lead frame but also centered by means of ejecting pins. Ejecting pins have the function of ejecting the lead frame out of the mould cavity after completion of the moulding cycle. An additional support is obtained by placing the pins onto the lead frame during moulding. Shortly before the end of the moulding cycle the pins are retracted from the frame in order to enable filling with plastic of the space formerly occupied by the ejecting pins.



**FOR THE PURPOSES OF INFORMATION ONLY**

Codes used to identify States party to the PCT on the front pages of pamphlets publishing international applications under the PCT.

AT	Austria	FR	France	MR	Mauritania
AU	Australia	GA	Gabon	MW	Malawi
BB	Barbados	GB	United Kingdom	NL	Netherlands
BE	Belgium	GN	Guinea	NO	Norway
BF	Burkina Faso	GR	Greece	NZ	New Zealand
BG	Bulgaria	HU	Hungary	PL	Poland
BJ	Benin	IE	Ireland	PT	Portugal
BR	Brazil	IT	Italy	RO	Romania
CA	Canada	JP	Japan	RU	Russian Federation
CF	Central African Republic	KP	Democratic People's Republic of Korea	SD	Sudan
CG	Congo	KR	Republic of Korea	SE	Sweden
CH	Switzerland	KZ	Kazakhstan	SK	Slovak Republic
CI	Côte d'Ivoire	LI	Liechtenstein	SN	Senegal
CM	Cameroon	LK	Sri Lanka	SU	Soviet Union
CS	Czechoslovakia	LU	Luxembourg	TD	Chad
CZ	Czech Republic	MC	Monaco	TG	Togo
DE	Germany	MG	Madagascar	UA	Ukraine
DK	Denmark	ML	Mali	US	United States of America
ES	Spain	MN	Mongolia	VN	Viet Nam
FI	Finland				

**APPARATUS FOR MOULDING A LEAD FRAME AND  
CHIPS ARRANGED THEREON**

The invention relates to an apparatus for moulding with an encapsulating material, for instance plastic, a lead frame and chips arranged thereon, comprising mould halves enclosing a mould cavity, a feed runner for liquid moulding material, means for respectively opening and closing the  
5 mould halves and pins oriented to the lead frame, connected to the mould halves and movable in relation to the relevant mould half for exerting an ejecting force on the lead frame after moulding.

10 With such an apparatus lead frames and the chips arranged thereon are encapsulated with plastic. To this end the lead frame is clamped between both mould halves and the mould cavity is injected full of liquid plastic. After hardening the frame encapsulated with plastic is released  
15 from the mould by means of the ejecting pins.

In addition to clamping the side edges of the lead frame between the mould halves, it is desirable during moulding to additionally centre the unattached portion of the lead frame on which the chip is also mounted. There is  
20 the danger that under pressure of the liquid moulding material the frame will be bent or otherwise damaged by forces exerted thereon.

It is therefore the object of the invention to provide means to additionally support the lead frame with  
25 the chip mounted thereon.

This is achieved by displacing means for displacing the pins between a position on the lead frame and a position at a distance from the lead frame.

By moving the ejecting pins onto the frame during  
30 moulding an additional support of the lead frame with the chip mounted thereon is obtained using the pins. Shortly before the end of the moulding process the pins are

retracted from the frame in order to ensure that the plastic also fills up the space formerly occupied by the ejecting pins.

After the moulding cycle the mould is opened in the known manner and the ejecting pins fulfil their original function, that is, releasing the moulded lead frame from the mould.

Such ejecting pins are preferably arranged on each of the mould halves.

10 The displacing means can be formed by an actuating member connected to a slide piece receiving the ejecting pins and standing under bias.

The bias can be derived from a coil spring.

The position of the ejecting pins on the lead frame 15 is defined by a stop member. This stop may be arranged on the mould half remote from the relevant mould half.

The invention will be further elucidated with reference to the annexed drawings.

In the drawings:

20 Fig. 1 shows a perspective view of the apparatus according to the invention,

fig. 2 shows a cross sectional view of the apparatus along the line II-II in fig. 1;

fig. 3 shows in perspective view a part of a lead 25 frame already partially encapsulated in the apparatus according to fig. 1 and 2,

fig. 4-7 show schematically the successive process steps of the apparatus according to the invention.

The apparatus 1 comprises mould halves 2 and 3 which 30 enclose the mould cavity 4. Mould half 2 is stationary and mould half 3 is movable in relation to mould 2 as according to arrow P1 and is guided therein by the guide rods 5 and 6. Mould half 3 is connected for this purpose to the pressure plate 7 using connecting pieces 8.

35 Displaceable relative to each of the mould halves is an ejecting pin bed 9 respectively 18 which carries the ejecting pins 11, 12, respectively 13, 14 and 15. The slide piece 9 for instance stands under bias of the coil spring 16

which confers on the slide piece 9 a bias force directed toward the mould space 4. Liquid moulding material is introduced via the runner 20

When, after moulding, the mould half 3 opens the cavity space 4 because this mould half is moved downward according to arrow P1 in the drawing as in fig. 1 and 2, the slide piece 9 is released whereby it is likewise moved downward relative to the mould half 2 under the influence of the bias force exerted by the spring 16, wherein the pins 11 and 12 fulfil their ejecting function by applying a force to the moulded lead frame. The same function is subsequently fulfilled by the ejecting pins 13 and 15 in the other mould half.

According to the invention the slide piece 9 is connected to the displacing means in the form of an actuating rod 17. The same provision is likewise arranged vice-versa in respect of the slide piece 18 in the other mould half. The actuating rod is designated here with the reference numeral 19.

Using the actuating rod 17 the slide piece 9 is displaced in the direction of the mould cavity 4 such that the ejecting pins 11 and 12 come to lie against the lead frame. The movement is bounded by a stop member (not drawn) on the other mould half 3. This is shown in fig. 3. The same applies for the pins 12 and 15, this being brought about by the slide piece 19. The lead frame is thus supported because it is clamped on the side edges by the mould halves 2, 3 and because it is further centered by the ejecting pins referred to in the foregoing. The liquid plastic which serves as encapsulating material is then supplied (fig. 4) through the runner 20. At the end of the injection operation the pins and the runner 14 are retracted in order to enable filling with plastic of the space formerly occupied thereby. This displacement takes place through operation of the actuating rods 17 and 19 (fig. 1).

The movable mould half 3 is subsequently moved to the right in fig. 6 whereby the mould cavity is opened. The slide piece 9 is also released, whereby it moves to the

right under influence of the bias provided by spring 16, and the ejecting pins 11 and 12 can perform their releasing action.

After the mould half 3 has moved completely to the right the ejecting pins 13 and 15 are released whereby the moulded lead frame is also released from the other mould half 3. The moulding cycle is then completed.

**CLAIMS**

1. Apparatus for moulding with an encapsulating material, for instance plastic, a lead frame and chips arranged thereon, comprising mould halves enclosing a mould cavity, a feed runner for liquid moulding material, means  
5 for respectively opening and closing the mould halves and pins oriented toward the lead frame, connected to the mould halves and movable in relation to the relevant mould half for exerting an ejecting force on the lead frame after moulding, **characterized by** displacing means for displacing  
10 the pins between a position on the lead frame and a position at a distance from the lead frame.

2. Apparatus as claimed in claim 1, **characterized in that** ejecting pins are arranged on each of the mould halves.

3. Apparatus as claimed in claim 1, **characterized in**  
15 **that** the displacing means are formed by an actuating member connected to a slide piece receiving the ejecting pins and standing under bias.

4. Apparatus as claimed in claim 3, **characterized in that** the bias is derived from a coil spring.

20 5. Apparatus as claimed in claim 1, **characterized in that** the position on the lead frame is defined by a stop member.

6. Apparatus as claimed in claim 5, **characterized in that** the stop member for defining the position on the lead  
25 frame is arranged on the mould half remote from the relevant mould half.

\*\*\*\*\*

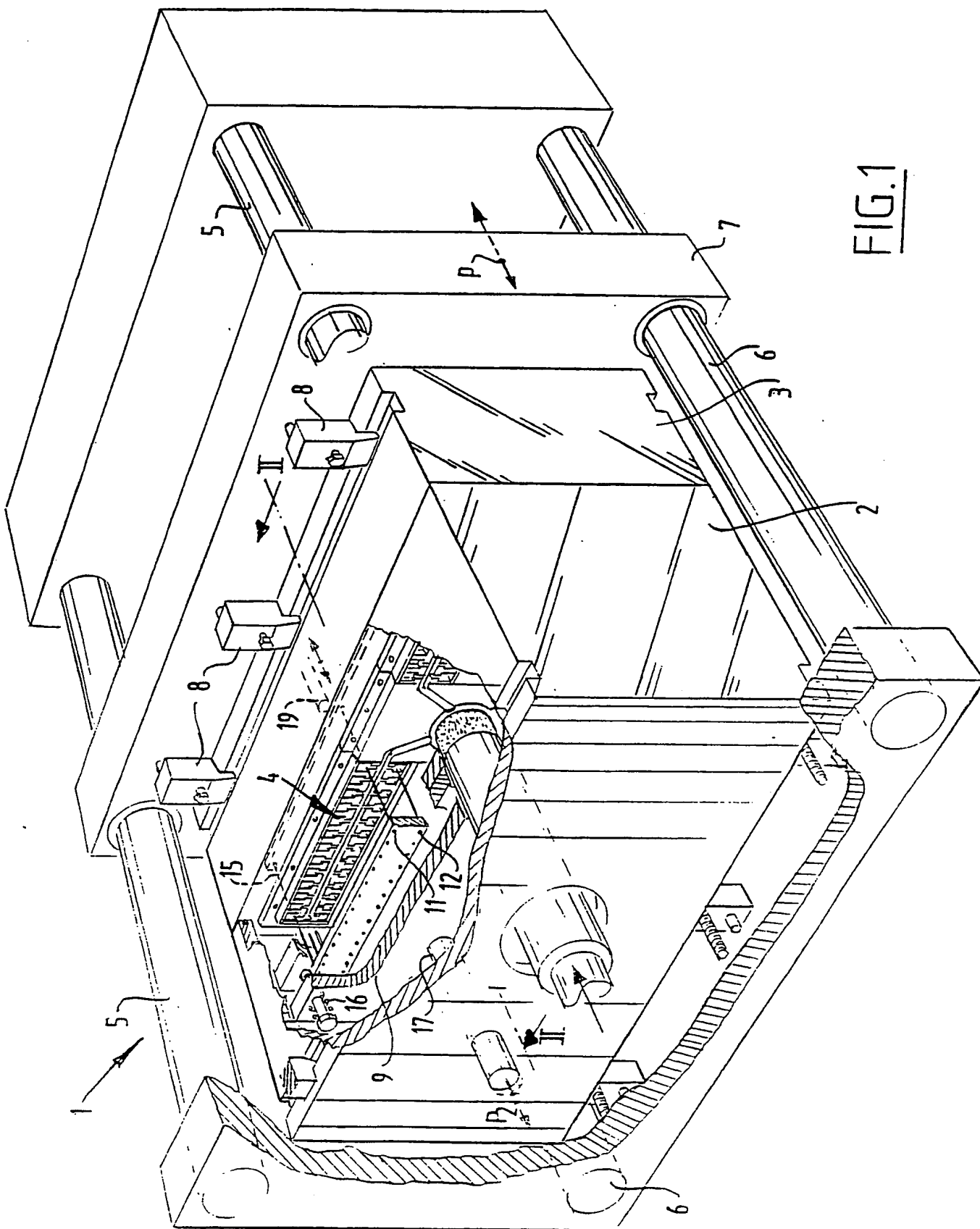
## AMENDED CLAIMS

[received by the International Bureau on 13 May 1993 (13.05.93);  
original claims 1-6 replaced by amended claims 1-4 (1 page)]

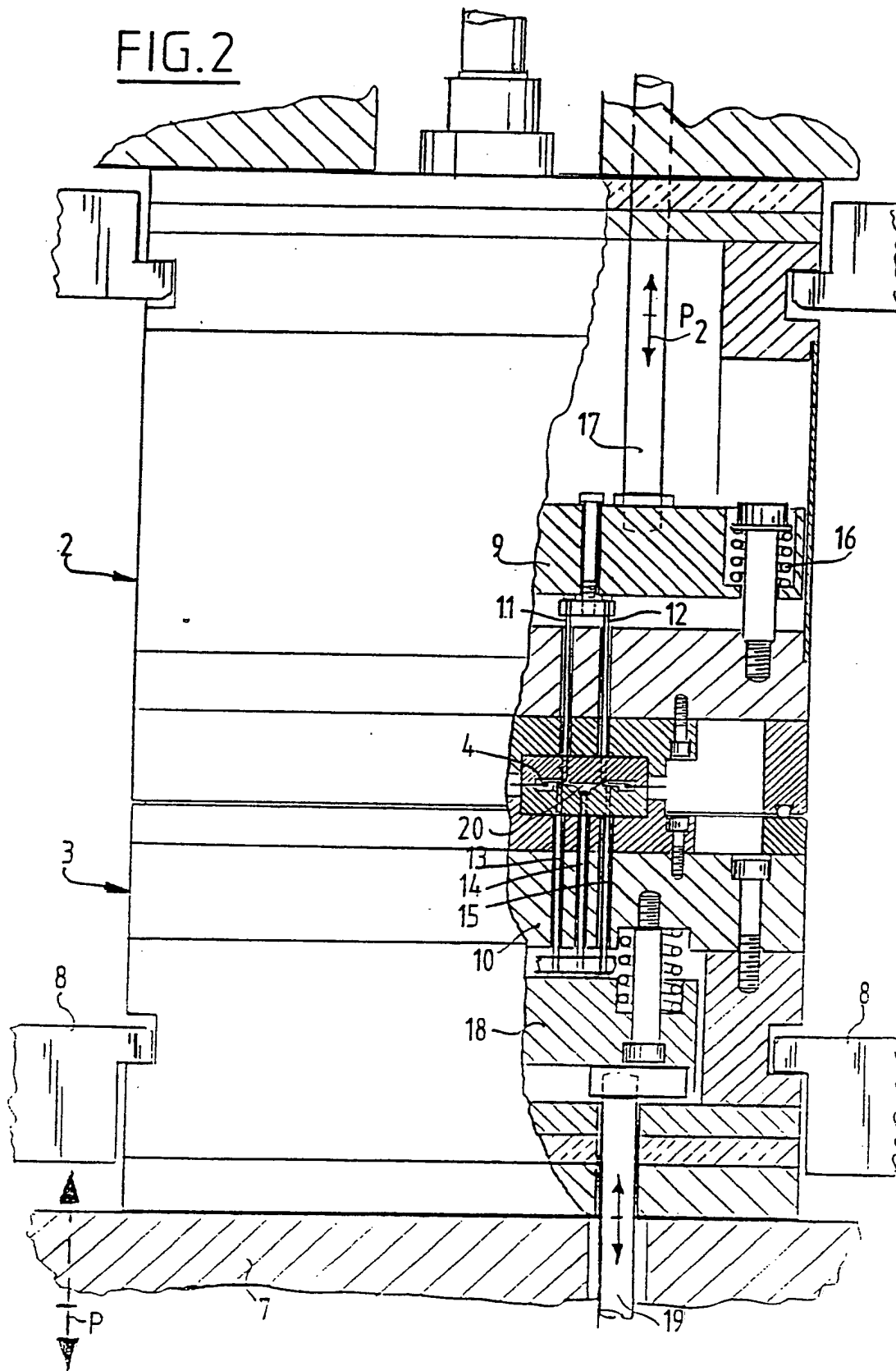
1. Apparatus for moulding with an encapsulating material, for instance plastic, a lead frame and chips arranged thereon, comprising mould halves enclosing a mould cavity, a feed runner for liquid moulding material, means  
5 for respectively opening and closing the mould halves and pins oriented toward the lead frame, connected to the mould halves and movable in relation to the relevant mould half for exerting an ejecting force on the lead frame after moulding and displacing means for displacing the pins  
10 between a position on the lead frame and a position at a distance from the lead frame, characterized in that the displacing means are formed by an actuating member connected to a slide piece receiving the ejecting pins and standing under bias.
- 15           2. Apparatus as claimed in claim 1, characterized in that the bias is derived from a coil spring.
3. Apparatus as claimed in claim 1, characterized in that the position on the lead frame is defined by a stop member.
- 20           4. Apparatus as claimed in claim 3, characterized in that the stop member for defining the position on the lead frame is arranged on the mould half remote from the relevant mould half.



1/7



2/7

FIG.2

3/7

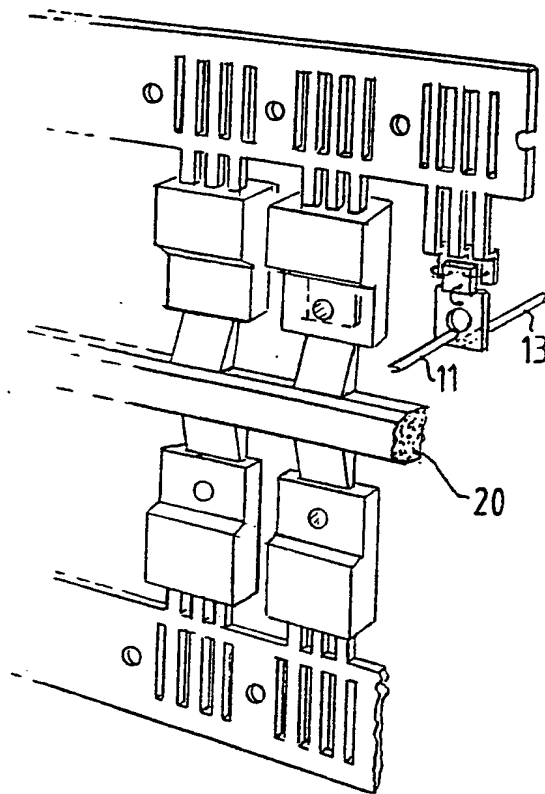
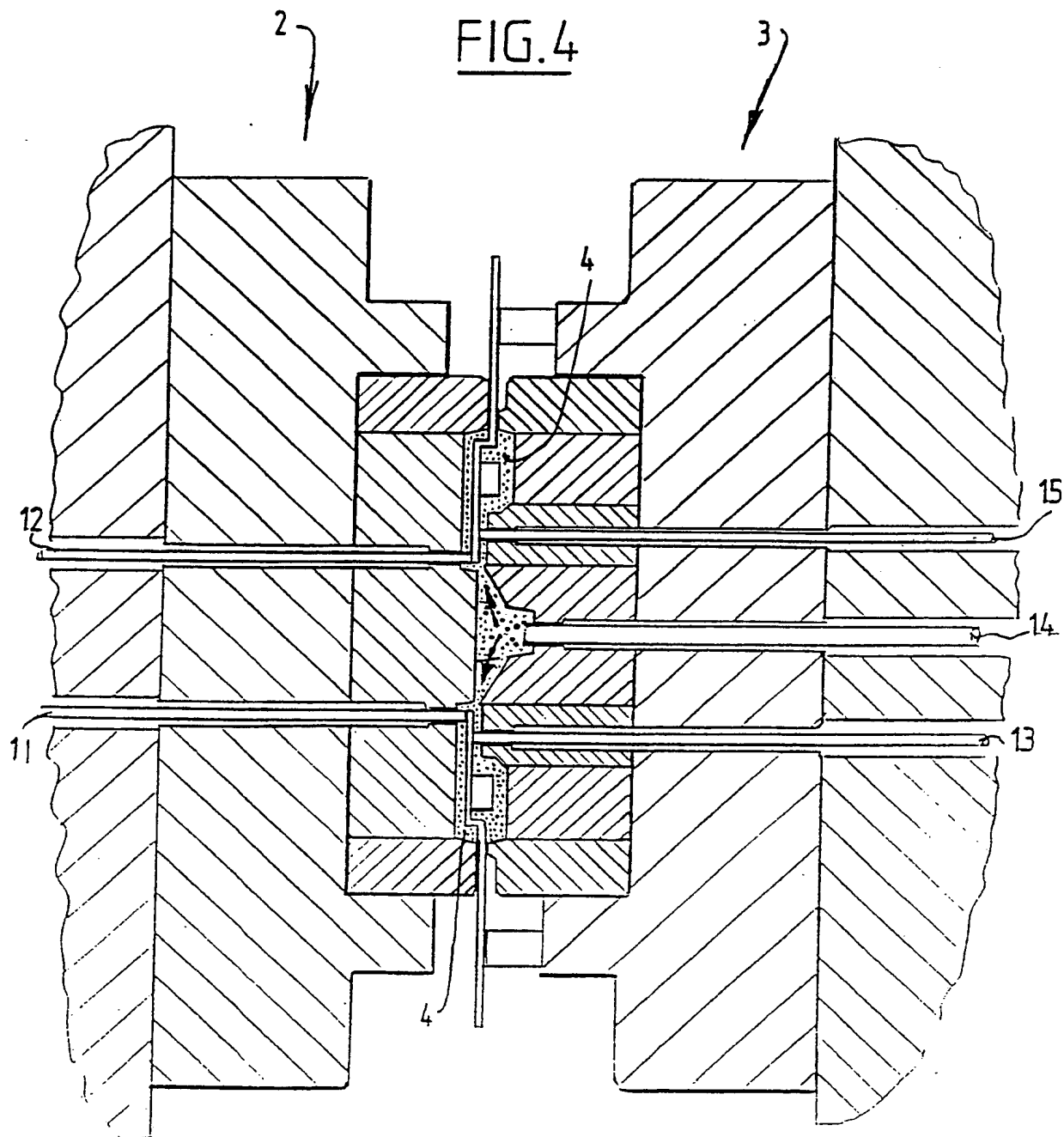


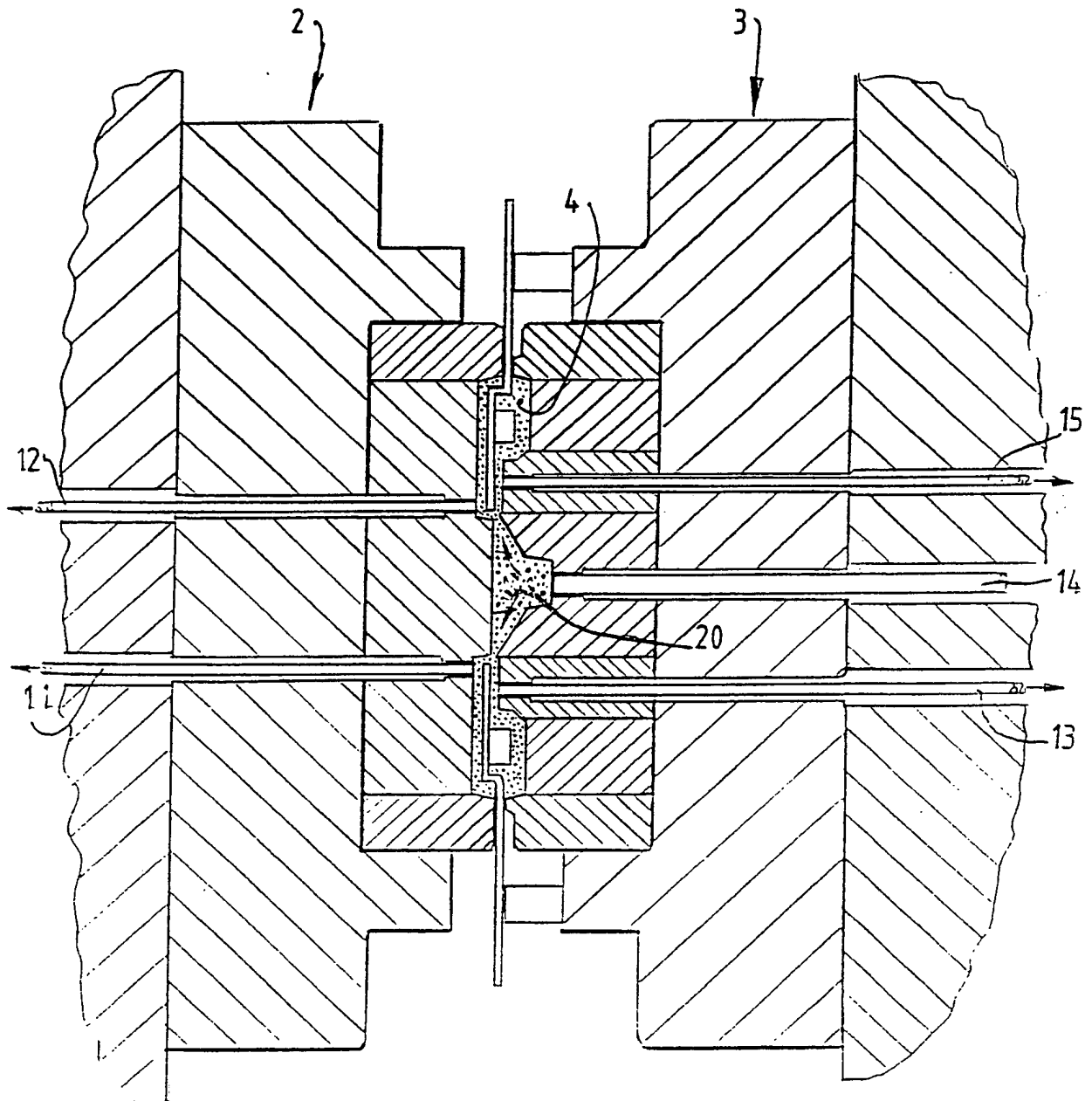
FIG. 3

4/7



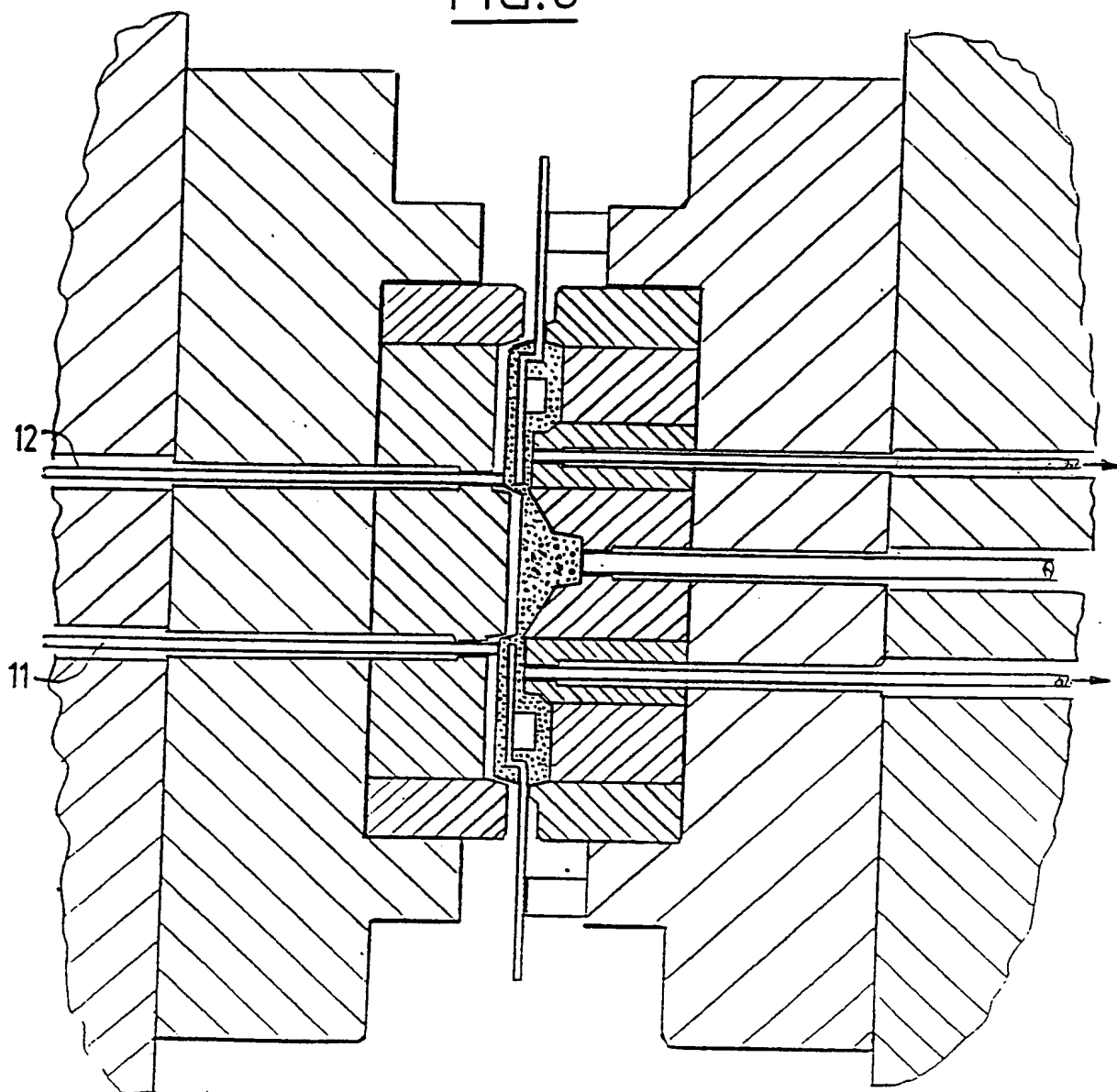
57

FIG.5



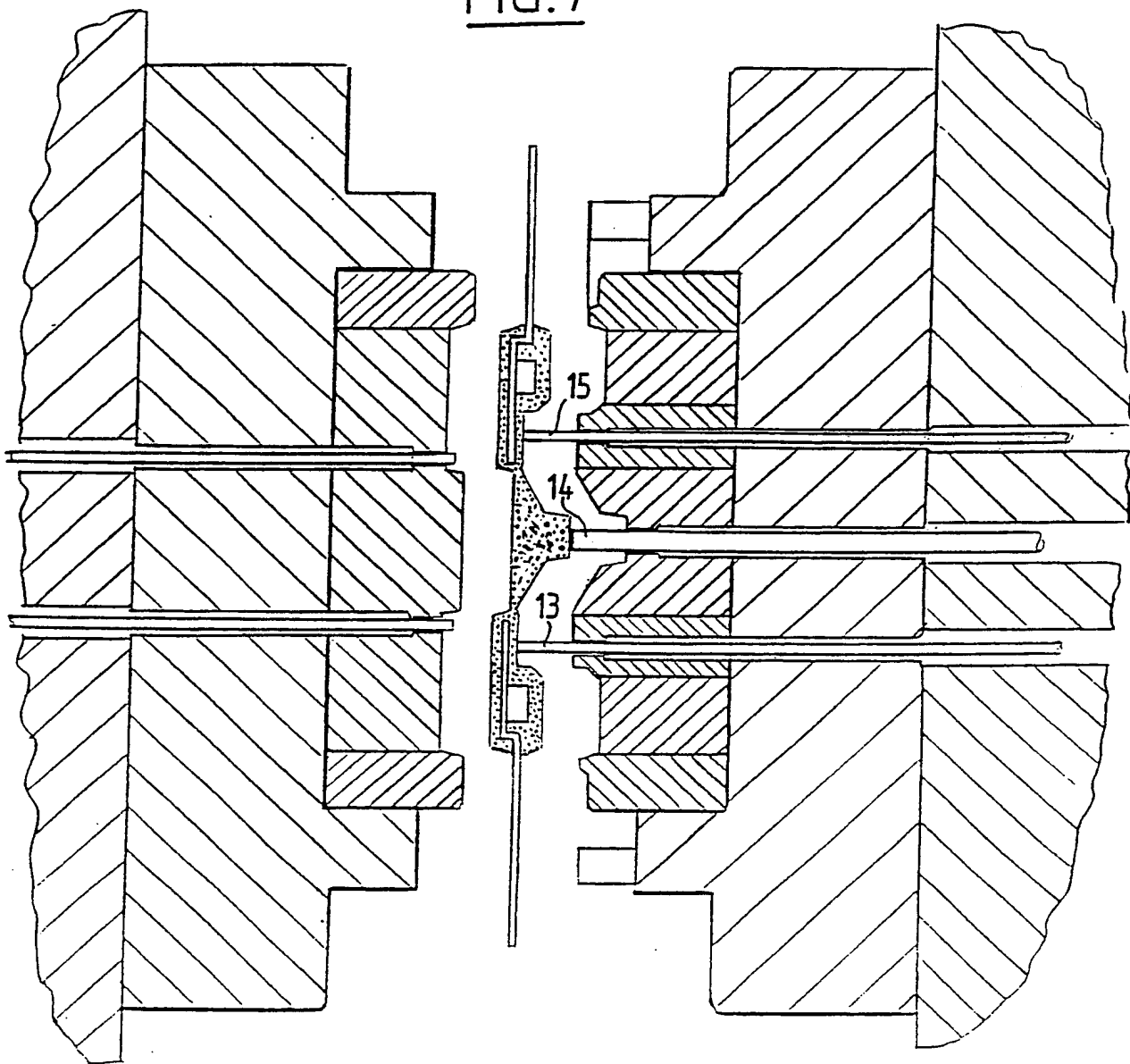
6/7

FIG.6



7/7

FIG. 7



## INTERNATIONAL SEARCH REPORT

International Application No

PCT/EP 93/00073

<b>I. CLASSIFICATION OF SUBJECT MATTER</b> (If several classification symbols apply, indicate all) <sup>6</sup>		
According to International Patent Classification (IPC) or to both National Classification and IPC		
Int.Cl. 5 H05K13/00; H01L21/00		
<b>II. FIELDS SEARCHED</b>		
Minimum Documentation Searched <sup>7</sup>		
Classification System	Classification Symbols	
Int.Cl. 5	H05K ; H01L	
Documentation Searched other than Minimum Documentation to the Extent that such Documents are Included in the Fields Searched <sup>8</sup>		
<b>III. DOCUMENTS CONSIDERED TO BE RELEVANT<sup>9</sup></b>		
Category <sup>o</sup>	Citation of Document, <sup>11</sup> with indication, where appropriate, of the relevant passages <sup>12</sup>	Relevant to Claim No. <sup>13</sup>
X	EP,A,0 257 681 (SGS MICROELETTRONICA S.P.A.) 2 March 1988 see column 4, line 30 - column 5, line 17; figures 6A-6C	1,2
A	GB,A,2 103 534 (OMRON TATEISI ELECTRONICS CO) 23 February 1983 see page 1, line 102 - page 2, line 52; figures 3A-4	1-6
<p><sup>o</sup> Special categories of cited documents : <sup>10</sup></p> <p>"A" document defining the general state of the art which is not considered to be of particular relevance</p> <p>"E" earlier document but published on or after the international filing date</p> <p>"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)</p> <p>"O" document referring to an oral disclosure, use, exhibition or other means</p> <p>"P" document published prior to the international filing date but later than the priority date claimed</p> <p>"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention</p> <p>"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step</p> <p>"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art.</p> <p>"&amp;" document member of the same patent family</p>		
<b>IV. CERTIFICATION</b>		
Date of the Actual Completion of the International Search		Date of Mailing of this International Search Report
02 MARCH 1993		10.03.93
International Searching Authority		Signature of Authorized Officer
EUROPEAN PATENT OFFICE		BOLDER G.



**ANNEX TO THE INTERNATIONAL SEARCH REPORT  
ON INTERNATIONAL PATENT APPLICATION NO.**

EP 9300073  
SA 68836

This annex lists the patent family members relating to the patent documents cited in the above-mentioned international search report.  
The members are as contained in the European Patent Office EDP file on  
The European Patent Office is in no way liable for these particulars which are merely given for the purpose of information.

02/03/93

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
EP-A-0257681	02-03-88	US-A- 4888307	19-12-89
		JP-A- 63062239	18-03-88
GB-A-2103534	23-02-83	JP-A- 58018222	02-02-83
		JP-A- 58018223	02-02-83
		DE-A,C 3228214	17-02-83
		US-A- 4470786	11-09-84

**THIS PAGE BLANK (USPTO)**